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Geographical Distribution of Developmental Dysplasia of the Hip: A Brief Epidemiological Study of Iran

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Abstract

Background: Local epidemiological data are necessary to identify the disease hot spots and running screening programs. In this study, we evaluated the demographic characteristics of developmental dysplasia of the hip (DDH) in a tertiary referral hospital in Iran.

Methods: In a retrospective study, the medical profiles of 137 DDH children, who were referred to our university hospital between 2014 and 2020, were reviewed for characteristics such as gender, place of birth, age at the diagnosis, gestational age (term or preterm), twin or single birth, mother's age, pregnancy number, breech presentation, associated deformity, family history of DDH, et cetera.

Results: The study population included 24 (17.5%) boys and 113 (82.5%) girls with a mean age of 2.3 ± 2 years. In the majority of cases (54.2%), it was the firstborn. Twin delivery was seen in only 5 (4.1%) cases. The associated deformity was noticed in 17 (12.4%) patients. Clubfoot was the most commonly associated deformity that was seen in 6 of 17 (35.3%) patients. A family history of DDH was recorded in 12 (8.8%) patients. The breech presentation was recorded in 19 (13.9%) patients. The mean age of the mother at the delivery was 27.2 ± 6.1 years. Tehran, Lorestan, Kurdistan, and Khuzestan provinces had the most referrals.

Conclusion: DDH is associated with the female sex, positive family history, breech presentation at delivery, clubfoot deformity, and geographic district. These associations could be used for identifying the disease hot spots and running screening programs for earlier detection and better management of DDH.

Keywords: Developmental Dysplasia of the Hip, Demographic Characteristics, Geographic District, Epidemiology

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Introduction

Developmental dysplasia of the hip (DDH) is an abnormal development of the hip with a wide spectrum of pathology, ranging from an asymptomatic acetabular dysplasia to a complete fixed dislocation (1). Numerous genes and loci had been attributed to DDH susceptibility. However, owing to the multifactorial nature of DDH inheritance, the presence of pathological genetic findings may not have a phenotypic presentation (2).

The earlier DDH is detected, the simpler and more effective treatment is implicated (3). As a general role, closed reduction and immobilization is the selected treatment for DDH detected below the age of 18 months. The selected

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↑What is "already known" in this topic:
Local epidemiological data are necessary to identify the developmental dysplasia of the hip (DDH) hot spots and running screening programs. In this study, female gender, breech presentation, positive family history, clubfoot deformity, and geographic district were associated with the DDH presentation in the Iranian pediatric population. These associations could be used for running local screening programs to help earlier detection of DDH, which results in better management of the DDH.

→What this article adds:
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choice of treatment after the age of 18 months is open reduction and hip reconstruction using various osteotomy techniques (4). Depending on the type of dysplasia, a femoral or pelvic osteotomy or a combination of both is implemented (4).

Despite the importance of early detection in the outcome of DDH, a considerable number of cases are missed because many DDH findings may not be present at birth (4). For this reason, screening of DDH in regions with high prevalence and children at increased risk for DDH is of critical value. This strategy allows early detection of DDH and sooner implication of therapeutic intervention, when a nonoperative treatment could be adequate for controlling DDH, thereby reducing the health and financial burden of DDH on both the society and the patient's family (5).

Comprehensive information regarding the epidemiology of the DDH is a prerequisite for the implementation of screening programs (6). In this cohort study, we aimed to evaluate the demographic characteristics of DDH in a series of patients who were presented to a tertiary referral hospital in Iran.

Methods

The review board of our institute approved this study. Between 2014 and 2020, medical profiles of the DDH children who were referred to Hazrat Rasool-e- Akram Hospital, Tehran, Iran, were retrospectively reviewed (Figure 1). All patients were enrolled from a referral hospital in Tehran, which is a pediatric orthopedic referral center. Patients with neuromuscular, teratologic, and/or syndromic hip dysplasia were excluded from the study.

The gender, place of birth, age at the diagnosis, gestational age (term or preterm), twin or single birth, mother's age, pregnancy number, breech presentation, type of delivery (normal vaginal or caesarian section), associated deformity, family history of DDH, and treatment and diagnosis modality were collected.

Statistical analysis

SPSS for Windows, Version 16 (SPSS Inc) was used for the statistical evaluation of the data. Descriptive data were demonstrated with mean ± standard deviation or number (%). The mean values of the 2 groups were compared using an independent samples t test or the Mann–Whitney U test. A comparison of mean values between more than 2 groups was made using a 1-way analysis of variance test or the Kruskal-Wallis H test. A P value < 0.05 was considered statistically significant.

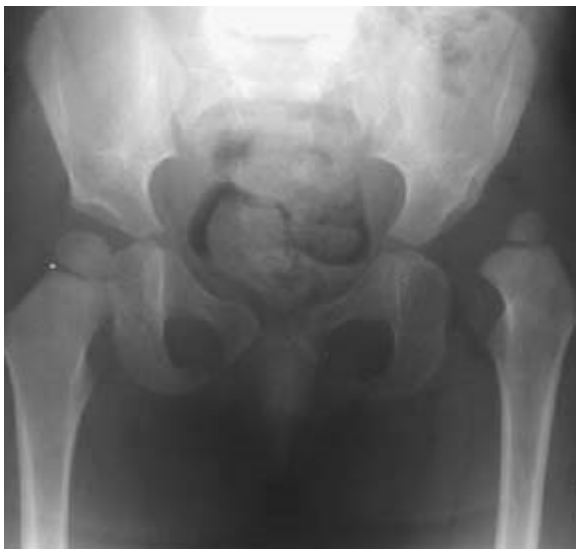

Figure 1. A 3-year old girl with left developmental dysplasia of the hip

Results

A total of 137 DDH children were included in this study. The study population included 24 (17.5%) boys and 113 (82.5%) girls, with a mean age of 2.3 ± 2 years (range, 3 months to 14 years). In the majority of cases, it was the first pregnancy (n = 51 out of 94 with available data). Twin delivery was seen in only 5 (4.1%) cases. The surgical treatment was performed with Salter osteotomy in 89 (65%) patients, Pemberton osteotomy in 2 (1.5%) patients, subtrochanteric osteotomy in 1 (0.7%) patient, and Spica cast with or without an open reduction in 24 (17.5%) and 21 (15.3%) patients, respectively. The diagnosis was with radiography in 118 (86.1%) and clinical evaluation in 19 (13.9%) patients. The associated deformity was noticed in 17 (12.4%) patients. Clubfoot was the most commonly associated deformity that was seen in 6 of 17 (35.3%) patients. A family history of DDH was recorded in 12 (8.8%) patients. The breech presentation was recorded in 19 (13.9%) patients. The mean age of the mother at the delivery was 27.2 ± 6.1 years (range, 15-41 years). Tehran, Lorestan, Kordestan, and Khuzestan provinces had the most referrals. The demographic characteristics are demonstrated in more detail in Table 1.

The mean age of diagnosis was 2.8 ± 3 years in boys and 2.2 ± 1.7 in girls. This difference was not statistically significant (P = 0.131). The mean mother's age was not significantly different between the boys and girls, as well (29 ± 7.2 vs 26.7 ± .8, respectively; P = 0.172). The age of diagnosis was not associated with the number of pregnancies (P = 0.235), the term of pregnancy (P = 0.811), and the type of delivery (P = 0.652).

Discussion

In this study, we evaluated the demographic characteristics of the DDH patients in a retrospective cohort. According to our results, 82.5% of patients were girls. In the majority of mothers, it was the first pregnancy (51 out of 91 with available data). The most common related malformation, which was present in 6 of 17 cases, was clubfoot (35.3%). The breech position was presented in 19 (13.9%) patients. Preterm delivery was recorded in 31 out of 94 patients with available data. Delivery was with a caesarian section in 53 out of 94 patients with available data.

To date, several risk factors have been suggested for DDH. Female gender is one of the most acknowledged risk factor for DDH, thus, a 9 to 1 female predominance has been reported (7). In the present study, the prevalence of female patients was nearly 5 times grate than males. Firstborn pregnancy is reported in about 60% of DDH patients (7). Firstborn pregnancy was seen in 56% of patients with available information in the present study. Nearly 20%

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Table 1. Demographic characteristics of DDH patients

Variable	Mean ± SD or Number (%) (n=137)
Age, y	2.3±2
Sex	
Male	24 (17.5)
Female	113 (82.5)
Number of pregnancies	
1	51 (37.2)
2	30 (21.9)
3	10 (7.3)
4	3 (2.2)
Missing	43 (31.4)
Treatment	
Salter osteotomy	89 (65)
Pemberton osteotomy	2 (1.5)
Subtrochanteric osteotomy	1 (0.7)
Spica cast without open reduction	24 (17.5)
Spica cast without open reduction	21 (15.3)
Diagnosis	
Radiography	118 (86.1)
Clinical	19 (13.9)
Associate deformity	
Yes	17 (12.4)
No	120 (86.7)
Breech presentation	
Yes	١٩)١٣,٩(
No	١١٨)٨٦,١(
Mother age (year)	27.2±6.1
Type of delivery	
Natural vaginal	41 (29.9)
Caesarian section	53 (38.7)
Missing	43 (31.4)
Term of delivery	
Term	62 (45.3)
Preterm	31 (22.6)
Post-term	1 (0.7)
Missing	43 (31.4)
Geographic province	
Tehran	35 (25.6)
Lorestan	10 (7.3)
Kordestan	9 (6.5)
Khuzestan	9 (6.5)
Others	49 (35.8)
Missing	25 (18.3)
Family history	
Yes	12 (8.8)
No	125 (91.2)

of DDH patients are born breech (7). In the present study, 13.9% of patients were born breech. There is no agreement on the impact of multiple births on the incidence of DDH. While some studies suggest an association (8), others deny such an association (9). In the present study, twin delivery was seen in only 5 (4.1%) cases. Older maternal age has been reported as a risk factor for DDH. The mean age of mothers was 27.2 years, with only 4 mothers aged ≥40 years.

There is no consensus regarding the effect of the delivery term on the incidence of DDH. Lange et al. reported a decreased rate of DDH in preterm infants (10). However, more recent studies show no effect of prematurity on the incidence of DDH (11). In the present study, preterm delivery was seen in 33% of patients with available data that was significantly higher than in the general population.

Positive family history has been reported as a risk factor for DDH (12). In the present study, 8.8% of patients had a positive family history. Patients with idiopathic clubfoot are reported to be at increased risk for having DDH (13). In the present cohort, 6 out of 17 associated deformities were clubfoot.

Cesarean section does not seem to affect the incidence of DDH (14). In the present study, 56.4% of DDH children with available data were delivered by cesarean section. However, data regarding the emergency or elective performance of cesarean section was not available.

Significant variability has been reported in the incidence of DDH within each ethnicity and racial group by geographic location (15, 16). Although there are no official statistics in Iran, the present study suggests that a greater percentage of DDH patients are referred from 3 provinces, including Lorestan, Kordestan, and Khuzestan. Tehran was the most frequent site of DDH referral in the present study. However, since the referral center was also located in Tehran, it could be attributed to the easy accessibility, and therefore future investigations are required to evaluate the prevalence of DDH in Tehran.

Similar to any other study, this study also had some limitations. The main limitation of the study was its retrospective design, resulting in a considerable number of missing data. Besides, since the data were obtained from one referral center, the generalizability of the results to the whole country might be biased.

Conclusion

The results of this study reveal that DDH could be attributed to several demographic characteristics, such as female gender, breech presentation, positive family history, clubfoot deformity, and geographic district. These associations could be used for identifying the disease hot spots and running screening programs for earlier detection and better management of DDH. However, future large-scale studies are required in the Iranian population to fully understand the effect size of these factors on the incidence of DDH.

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None

Authors Contribution

Alireza Ghaznavi: Study design and conceptualization
Mehdi Mohammadpour: Drafting the manuscript
Arash Noori: Critically reviewing the manuscript
Maziar Rajei: Data collection and statistical analyses

Conflict of Interests

The authors declare that they have no competing interests.

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